The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154, FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON — Telephone: CENTRAL 3212 (10 lines)
GLASGOW: 116, Hope Street (Central 3970) — BIRMINGHAM: Daimler House, Paradise Street (Midland 0784-5)
THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

VOL. XLIII. No. 1116 — November 16, 1940 — Annual Subscription, 21s. Overseas, 26s.

Rising Costs

PRODUCTION costs in this country have risen steadily in spite of every effort to keep them down. There has been a steady increase in the cost of living and that fact is, of course, basically responsible for a portion of the other increased costs. It is difficult to see how that item can be prevented in view of the fact that the country imports so much of its foodstuffs from abroad. What is described as "the rising costs of coal production" has caused the Mines Department to sanction a further increase of 1s. 9d. per ton in the pithead price of all coal with further special increases for South Wales and Kent. These price increases are stated to be granted in order to meet the rising costs incurred by the industry on account of loss of output, of wage increases, and of increases in the cost of stores, materials, and workmen's compensation. It is significant to note the items of which this is made up. The Yorkshire miners have had four increases in wages since the war amounting to 1s. 10d. per shift. An increase has just been granted upon railway freight charges. It is no doubt necessary that the railways should be self-supporting and that increased costs should be borne by those who use them; but it is also to be noticed that wage increases of £11,000,000 and £6,500,000 have already been made in addition to the increased cost of coal, iron and steel, and timber. On November 1 further increases in the price of steel came into force, this being the fourth price increase since the war commenced. It is said to be due largely to the importation of large quantities of steel at high prices, of which a big proportion is represented by freight and insurance. Imported steel costs considerably more than steel produced in this country, but even here as in other industries the increased costs of coal and transport rates make their influence felt.

The increased costs, it will be observed, may be made up of such items as insurance, freight and the purchasing power of sterling abroad for materials imported, and here we are largely powerless, but the major cost of nearly every home-produced commodity is ultimately the cost of labour. One important problem, therefore, is to regulate the rate of increase of wages in accordance with what is inevitably due to outside conditions and to avoid any trace of extraneous increase such as would only lead to an improved standard of living. That, desirable as it is, must be a slow growth of peace and not a mushroom growth of war. The difficulties caused by foolish wage rates in the last war which enabled semi-skilled engineering employees to earn £20 a week on piece-work—money expended by them on luxury goods—is too well remembered.

A critical point has now been reached in our war-time economy by the rejection by the engineering employers of an application of the Unions in the industry for a substantial advance. The employers have recognised that the industry now works for the Government and is not regulated by well-organised competition as it is in peace time; it can therefore hold a pistol to the Government, *i.e.*, to the Nation, and demand higher prices with which to pay wage increases. To do so would be to start the vicious spiral which we knew so well during the last war. The employers, moreover, quote figures to show that the actual and relative earnings of the men in the engineering industry are good and sufficient and that there is no justification for the suggested increase.

The Unions are entitled, of course, to take a different view and say that such nice scruples are not influencing other industries, but, while allowing for increased prices and wages to counterbalance those increases which are inevitable and outside our control, we must avoid any conflict between sections of labour and the Nation as its employer. The time has come when the Government will have to hammer out with the Unions as a whole a definite national wage policy. Increases which merely lead to a high standard of living, as we have already pointed out, must be avoided. If ability to pay is the only measure of wage increase, we shall soon be back in the bad conditions of the last war; and everyone remembers how when profits and prices got out of hand they were followed by a crash in the early post-war years which brought whole industries to the verge of ruin, and was probably to a large measure responsible for the breakdown of all attempts of post-war planning. The national interest now requires a national policy.

NOTES AND COMMENTS

Engineering Wages

THE contention of engineering employers that the wage increases applied for by their employees would not be in the national interest, unless it could be shown that they were an urgent necessity, is borne out by the figures that they now quote, which were published by the Labour Correspondent of *The Times* last Wednesday. In the period October, 1939-July, 1940, the hours of work for skilled workmen increased by 5.6 per week, and earnings by 28s. 1½d. per week. Corresponding figures for semi-skilled workers were 5.6 hours and 24s., for unskilled workers 4.5 hours and 16s. 4d. Skilled fitters working 58.3 hours per week earned 113s. 3d. in a test week in July on time rates; those working 59 hours on piece rates averaged 142s. 3d. a week, the general average being 133s. 4d. Sheet metal workers averaged 141s. 6d. a week for 56.5-56.7 hours, loose pattern moulders 105s. 5d. for 52.3-54.3 hours, platers, riveters and caulkers 115s. 2d. for 54.2-54.4 hours, and labourers 86s. for 58.7-58.9 hours. In every case, of course, the weekly earnings on piece rates were considerably higher than those for time rates. The engineering employers contend that the increase in payment required would not be equitable towards other sections of the community, including the fighting men, and they point out that although the engineering industry did not control a national wage policy, what they did in respect of wages must have a profound effect on such a policy.

Official Safety-First Service

RECOGNISING the absolutely first-rate importance of the prevention of factory accidents in war time, the Minister of Labour has arranged for a special safety-first service to be maintained by the Factory Department of his Ministry, with the experienced help of the National Safety First Association. The service consists of four distinct items per unit, namely, one copy of a pamphlet, "Works Safety in War Time"; one copy of a 30 in. by 20 in. poster every week (issued monthly—ideally on the first Monday in each month); one copy per month of the Industrial Safety Bulletin; and one copy each of four pamphlets suitable for distribution to workers. Works with a complement of workers up to 400 are entitled to one unit of service; with 400 to 1000 workers they receive two units; and one unit is added for every extra thousand or part of a thousand (maximum, ten units). Additional material can be purchased through the National Safety First Association. The new pamphlet, "Works Safety in War Time," contains three sections: the first deals with the above arrangements; the second gives a concise and useful outline of works safety organisation; and the third gives a few cogent indications as to how an efficient first-aid service can be maintained. One of the four pamphlets for distribution to workers, moreover, is devoted to blood poisoning, with the special aim of combating a high sepsis rate. THE CHEMICAL AGE has devoted special attention, since the war started, to the maintenance of safety-first conditions, and we welcome this official co-ordination of the widespread individual efforts towards the safety and physical security of the factory worker.

A Week's Factory Accidents

HOW necessary are the safety recommendations for factories broadcast by the Ministry of Labour and National Service, and insisted upon, so far as chemical works are concerned, in the columns of this journal, is proved by the following week's diary from the annals of a provincial accident hospital. The facts are taken from the local weekly newspaper serving the district—a district noted for its connection with the chemical industry—and they are regrettably typical of the sort of thing that is going on in works all over the country. It will be seen that all the accidents described could have been avoided if works' safety measures had been carefully attended to. A lad of 14 was first admitted to hospital with injuries to the groin caused by a weight falling on him. Next, a man of 42 was treated for injuries to his knee resulting from a fall. Yet another fall, a drop of over 20 feet this time, sent a man of 24 to hospital with a fractured arm and back. And finally a man of 28 arrived, burned on arms and face from a back-draught. That every single one of these accidents could have been averted by the strict observance of safety rules is immediately apparent; and four unnecessary casualties in the ranks of the national army of workers were caused by the lack of this observance.

The Vitamin B_2 Complex

CRITICISM of the Government scheme for adding a proportion of synthetic vitamin B_1 to white flour has been voiced in several quarters. It is asserted, for example, on the basis of rat-feeding experiments, that white bread plus synthetic vitamin B_1 plus calcium salt does not stimulate animal growth to the extent that natural wholemeal bread does. The missing factor is believed to be vitamin B_2, actually a complex mixture of a number of factors about which new facts are constantly coming to light in nutritional and medical laboratories. In the vast literature on the subject down to about 1939 we find references to three groups of factors each of which appears to exercise an individual and specific biological action. The first group embraces the *growth factors* and includes lactoflavin (or riboflavin) and the so-called W factor. Lactoflavin has been isolated in crystalline form from milk and is also abundantly present in yeast, animal liver and egg albumen. Karrer in Switzerland and Kuhn in Germany have carried out distinguished work in the last few years in establishing the chemical structure of lactoflavin and finally in producing it in the laboratory. The molecule contains the sugar, ribose, attached to the polycyclic alloxazin system and it is commonly designated: 6,7-dimethyl-9-(d-l-ribityl)isoalloxazin. At least one American firm of fine chemical manufacturers is marketing synthetic lactoflavin and this member of the B_2 complex is the one most commonly used. The second group of *skin factors* includes the pellagra-preventive (P.P.) factor, the filtrate factor and the anti-rat-pellagra factor. Of these the first was identified as nicotinic acid although synthetic nictonic acid amide has since been found to be more effective; the filtrate factor has not been identified; and the third, now generally known as vitamin B_6, has recently been isolated as a chemical entity (pyridoxine). To these it now seems necessary to add a fourth factor in the shape of pantothenic acid, work published earlier this year indicating its importance as both a growth-promoting and an antidermatitic factor. Recent synthetic work in the United States reveals pantothenic acid to be a dihydroxy dimethylbutyryl alanide which has been synthesised by a number of independent workers. Finally the third group comprises a number of *anti-anaemic factors*, the existence of which has been deduced from specific effects of certain fractions of vitamin concentrates. Little is known about their chemical nature.

Two Useful Intermediates

Diethylaniline and Benzylethylaniline

by G. S. RANSHAW

CURRENT interest is evident, no doubt owing to the present situation, in certain dyes of the triphenylmethane class which, although not distinguished by any special properties of fastness, yet enable colours of particular liveliness and fulness to be obtained. These dyes, easily applied, are derived from the two intermediates which are the subject of this article, and it has seemed useful to indicate some recent work which has been done on them.

Diethylaniline

Examination of the literature shows that several methods have been worked out for the production of diethylaniline. They include, principally, the ethylation in an autoclave of aniline hydrochloride at 140° to 180° C. using ethyl alcohol, catalysts of the $CaCl_2$ or NaBr type being employed in certain cases; ethylation in an autoclave of aniline or ethylaniline by means of alkyl halides, $Ca(OH)_2$ or $Ba(OH)_2$ being used as catalysts if desired; and action of a mixture of the vapours of aniline and ethyl alcohol in presence of Al_2O_3, SiO_2 or ThO_2 as catalysts, temperatures to the order of 350° or 400° C. being used. To these should be added two syntheses of diethylaniline, (1) commencing with acetaldehyde and aniline, reacting with Zn and SO_2 or $CuSO_4$, (2) by the introduction of boiling ethyl bromide into a mixture of aniline and caustic soda heated to 85° C.

The raw diethylaniline from any of these processes will be accompanied by traces of the mono-derivative and by a certain amount of aniline which has not been transformed, and several processes for the purification and separation of the diethylaniline have been proposed. A method patented by Hinsberg (B.P. 265,179) is based on the elimination of primary and secondary amines in the form of their compounds with benzene or toluene sulphochloride. The primary and secondary amines give respectively.

$$(1)\quad C_6H_5.NH-SO_2.C_6H_5 \text{ and } (2)\quad C_6H_5.N\begin{array}{l}\diagup C_2H_5\\ \diagdown SO_2.C_6H_5\end{array}$$

A further method of separation requires the mixture of amines to be treated with chlorosulphonic acid, the primary and secondary amines being transformed into sulphamic acids.

$$(3)\quad C_6H_5.NH.SO_3H \text{ and } (4)\ C_6H_5.N(C_2H_5)SO_3H$$

Finally, the diethylamine can be separated from the monoderivative by treatment with carbon bisulphide in presence of ammonia and zinc, the monoethylaniline reacting to give zinc ethylphenyldithiocarbonate, which will be recognised as a very good accelerator for rubber:

$$C_6H_5.NH.C_2H_5+CS_2+NH_3+ZnCl_2+\quad H_2O_2\rightarrow \left[C_6H_5.N\begin{array}{l}\diagup C_2H_5\\ \diagdown \begin{array}{c}C-S-\\ \|\\ S\end{array}\end{array}\right]Zn$$

The precipitate of zinc ethylphenyldithiocarbonate is separated from the diethylaniline (which does not enter into the reaction) by filtration.

Benzylethylaniline

The process for the preparation of benzylethylaniline consists of the benzylation of monoethylaniline by benzyl chloride. More interesting is a process for the simultaneous preparation of diethylaniline and benzylethylaniline; the ethylation of aniline is so conducted as to obtain a mixture of mono- and diethylanilines, which is then treated with benzyl chloride. This reagent acts only on the mono-derivative and on traces of aniline remaining in the mixture. In this manner pure diethylaniline is obtained besides benzylethylaniline. The method practised most extensively at present, however, entails the benzylation of a mixture of amines by benzyl chloride in an aqueous caustic soda medium. In America of late, however, it is considered more convenient to benzylate the mixture of amines in aqueous media (U.S.P. 1,884,772 of 1932) with some diethylaniline present to fix the acid. The process is as follows: benzyl chloride, in quantity corresponding to the proportion of mono-derivative in the mixture, is added little by little to the mixture of di- and monoethylaniline. The reaction mass is then heated for several hours at 125° C.; the diethylaniline and the benzylethylaniline are separated by distillation in steam.

Benzylating an Amine Mixture

When an aniline salt is ethylated for 3 hours at 180° C., the ratio of aniline to alcohol being 1:3, a raw material for benzylation is obtained comprising 70-73 per cent. diethylaniline, 30-27 per cent. monoethylaniline and 0.5-2 per cent. aniline. This mixture may be taken as standard for the purpose in hand. Besides the principal reaction, however, various side reactions occur. The diethylaniline, for instance, is transformed by benzyl chloride into (5) and the benzylethylaniline into (6)

$$(5)\quad \begin{array}{c}C_6H_5.N\\ |\\ Cl\end{array}\begin{array}{l}/\!\!/ (C_2H_5)_2\\ \diagdown CH_2.C_6H_5\end{array}\qquad (6)\quad \begin{array}{c}C_6H_5.N\\ |\\ Cl\end{array}\begin{array}{l}/\!\!/ (CH_2\ C_6H_5)_2\\ \diagdown C_2H_5\end{array}$$

On the other hand, the hydrochloric acid which is formed in the course of the reaction gives rise to salts of the amines. In cases where caustic soda or sodium carbonate is employed to fix this acid, there may be hydrolysis of the benzyl chloride, leading to the production of benzyl alcohol. Recent investigation goes to show that in using $CaCO_3$, etc., to fix the hydrochloric acid, the reaction goes the same way; best results are obtained with anhydrous sodium carbonate, the yield of benzylethylaniline being about 75 per cent. of the theoretical.

The elevated temperature indicated in the original U.S. patent quoted does not seem, moreover, to be necessary. If the reaction is duly prolonged, the operation can be completed below 100° C. In order that the reaction may be pushed as far as possible, *i.e.*, so that the final product contains no more than 0.5-0.6 per cent. of the mono-derivative, it is necessary to employ a large excess of the benzylating agent; theoretically 3-5 per cent. of monoethylaniline is the correct yield. The manner of introduction of the benzyl chloride, too, would seem to have no important influence on the final result, but if it contains impurities in the form of benzylidine chloride or chlorotoluene the yield of amine is very small. The maximum yield of benzylethylaniline, which should be about 87 per cent. of the theoretical, can be obtained with a benzyl chloride of density 1.105 at 15° C., and boiling point between 178° and 179° C. A process on these lines attributed to G. Blanc uses benzene, formaldehyde and hydrochloric acid and gives a suitable benzylating agent; benzyl chloride derived from toluene is not so satisfactory, the benzylethylaniline yield only amounting to 74 or 75 per cent. of that theoretically obtainable.

The secondary reactions occurring in the course of benzylation have been examined by I. Lapteff. He heated an equimolecular mixture of diethylaniline and benzyl chloride for several hours at 80°-85° C. The cooled mass was treated with cold water and the latter carefully separated from the supernatant oil. This operation was repeated several times.

The aqueous solution may contain the ammonium compound and the hydrochloride and diethylamine:

$$(7)\quad C_6H_5-\underset{\displaystyle Cl}{\overset{\displaystyle (C_2H_5)_2}{N}}\diagdown CH_2.C_6H_5$$

The total chlorine contained in (7) and the amine hydrochloride is estimated with silver nitrate, then the chlorine contained in the amine hydrochloride is estimated with caustic soda; the ammonium body does not react with the latter under these conditions. The difference in chlorine formed corresponds to body (7). No ammonium body is present if the results of the two determinations are the same.

A further test performed by Lapteff was designed to show whether the product of the principal reaction, benzylethylaniline, was not in part transformed to an ammonium compound, while another series of tests established the influence of water. With 5 per cent. water there is no action favouring the formation of an ammonium compound; on the contrary, a tarry mass results and the benzyl chloride tends to become hydrolysed (2-4 per cent.). An addition of 3-5 per cent. ethyl alcohol or benzyl alcohol does not give rise to the formation of an ammonium compound. The quantity of diethylamine in the mixture must be sufficient to fix (even with slight excess) all the hydrochloric acid formed by the reaction. The ideal mixture for benzylation contained no aniline. In a mixture containing 28-29 per cent. of monoethylaniline there is always 0.6-0.7 per cent. of aniline. This can rise to 1-2 per cent. in a mixture containing 30-32 per cent. monoethylaniline. This amount of aniline does not sensibly lower the yield of diethylaniline and benzylethylaniline, but renders a supplementary purification necessary.

To summarise: the production of diethylaniline and benzylethylaniline can be conducted in two ways: either the mixture of amines can be benzylated with almost the theoretically required amount of benzyl chloride, obtaining, after separation from the reaction mass, ethylbenzylaniline with about 5 per cent. monoethylaniline, or, by utilising an excess of benzyl chloride (25 to 30 per cent.) and aiming at almost total benzylation, a diethylaniline with 0.3-0.5 per cent. monoethylaniline is obtained. In the first case a separation is obligatory, in the second it may be eliminated. The purification is accomplished most easily by ethylating the monoethylaniline still contained in the mixture, using ethyl bromide. Other methods of purification have been suggested (phthalic anhydride, etc.) but seem too expensive, since they would all entail the recovery of the monoethylaniline.

Separation Processes

The simplest process for the separation of diethylaniline and benzylethylaniline entails distillation in steam. When the two amines are in equal proportions, about 4.2 per cent. of benzylethylaniline is carried over with the diethylaniline. Treatment with dilute sulphuric acid in sufficient quantity to convert all the amines, which pass into solution leaving the other bodies in the form of an oil, is equally unsatisfactory. The mixture of amines is separated, and the oil dried and distilled *in vacuo*, but benzyl chloride is susceptible to solution in appreciable quantity in the aqueous solution of amine salts, while on the other hand, in spite of the important difference between the boiling points of these two amines, they cannot be separated, and several intermediate fractions are found.

Another method takes account of the difference in the basicities of the two amines diethylaniline is a strong base and benzylethylaniline a feeble one. Most European concerns base their process on this fact, proceeding as follows: 100 gm. of a mixture containing 70 per cent. diethylaniline, 29 per cent. monoethylaniline and 10 per cent. aniline is benzylated. On completion of the reaction, about 9.5 gm. HCl are liberated; this takes 38.7 gm. diethylaniline. In consequence, 31.3 gm. diethylaniline remain, combining with 10.5 gm. HCl calculated at 100 per cent. and used as a 5-10 per cent. solution. After treatment with sulphuric acid, the aqueous layer containing the hydrochloride and sulphate of diethylaniline, and the oily layer which contains benzylethylaniline, benzylchloride and tarry matter, are allowed to settle. The aqueous layer is treated with caustic soda and the diethylaniline freed is distilled either in steam or *in vacuo*. A diethylaniline containing not more than 0.5 per cent. of the mono-derivative and free from benzyl chloride should be obtained.

The separation of the benzylethylaniline from accompanying impurities is effected by treating the raw oil with sulphuric acid (dilute, cold). The benzylethylaniline passes into solution in the form of sulphate. Treatment with caustic soda follows and the raw base is again distilled *in vacuo*.

New German Chemical Patents

Potassium Formate

IN a process for the manufacture of potassium formate from inorganic materials (G.P. 686,148, Rudolph Koepp and Co.) a mixture of 6 mols potassium sulphate and 5 mols lime in an aqueous medium is treated with carbon monoxide at high temperature and pressure. The resultant potassium formate remains in solution while the pentacalcium sulphate-potassium sulphate which separates out can be used to yield more potassium formate by treatment with fresh carbon monoxide.

Polyvinyl Alcohols

Dyes of the type of congo red are used to modify the properties of water-soluble polyvinyl alcohols or their derivatives (G.P. 686,123, Chem. Forschungsg.). On mixing an aqueous solution of a medium-viscosity polyvinyl alcohol with an equal volume of a 1 per cent. aqueous solution of congo red, a solid mass was formed after the mixture had been standing for two days.

Flax-Bleaching Process

A two-stage process for the bleaching of flax and similar fibres is outlined in G.P. 686,091 (Oranienburger Chem. Fabrik). Dilute mineral acid and a wetting agent are the components of the first bath (*e.g.* 2.5 c.c. of 20° Bé hydrochloric acid and 0.3 g. sodium isobutyl naphthalene sulphonate per litre) which is kept at a temperature of 50° C.; actual bleaching agents are present in the second bath (*e.g.* 10 per cent. active chlorine and 2 per cent. caustic soda) together with an emulsifying agent (amyl alcohol ester of sulphonated castor oil).

Japanese Chemical Progress

Removal of Sulphur from Water Gas

ELIMINATION of sulphur from water gas to be used in petrol synthesis can be effected with the aid of mixtures of sodium hydroxide, copper hydroxide and lux mass. An advantage of the process is that it can be operated at very moderate temperaturs. A gas containing 14.6 grams organically combined sulphur per 100 cubic metres was treated with the new absorbent mixture at 200°-250° C. and was subsequently found to contain less than 0.2 gm. sulphur per 100 cubic metres. . . . W. Funasaka, *J. Soc. Chem. Ind. Japan*, July, 1940, p. 203B.

Preparation of Partial Glycerides

The best yields of mono- and distearin are obtained, according to Kawai and Nobori (*J. Soc. Chem. Ind. Japan*, June, 1940, p. 170B), by heating one molecule stearic acid with 1.2 and 1.4 molecules glycerine respectively at 180° C. for a few hours and then for a shorter time at 240° C. The effect of the higher temperature was more marked in the case of the diglyceride, for whereas the yield of monostearin was the same (20 per cent.) at both temperatures, that of distearin could be increased to 70 per cent. by the supplementary heating at 240° C. for 30 to 60 minutes. These partial glycerides are finding application in soap manufacture and other industries.

Notes from Works Safety Jottings

Attention to Health Hazards

by JOHN CREEVEY

IN the matter of safety there is always much to be learned. New processes, or modifications of old ones, new plant and changed operating technique, new products, whether intermediate or final—all have something to say in intimate association. If we are wise our thoughts go beyond the point where they are assured of efficiency in operation, and yield and quality of product. No process or plant can be considered efficient to the degree desired unless it makes its own contribution to safety viewed from all aspects. There is more than one aspect, each with its own degree of importance according to the nature of the process and the materials which enter into the reaction, apart from details of the plant and the failings which may arise in operation. Explosion and fire could become common hazards, if conditions were always favourable; luckily, it is only sometimes that they are favourable. Mechanical injury is likely to be present wherever there is negligence, or insufficient thought for avoiding it, or inadequate safeguards against it. Health hazards there are, as well, some of which may be unsuspected until the experience has caught us; others, in the knowledge that already exists, we can reduce to the smallest possibility by attention to detail in plant design (and our choice of individual accessory features) as also by the attention given to operating instructions and the selection of personnel. Negligence in maintenance may easily bring a breakdown; it can just as easily give leakage at a gland or a joint in the system of valves and pipes and so allow gas or vapour to escape into the atmosphere. Consequences will vary with circumstances; they may be immediate or delayed, sometimes all unsuspected their ill-effect may be long in being realised. More than once has a fatality become the point where conditions have called for the immediate investigation of something which was not all that it should be.

* * * *

The drafting of regulations for the control of health hazards becomes fairly easy when the circumstances demanding precautions are once known. There are exceptions, as where careful investigation has been necessary to reveal the true cause of trouble, or where a new material is in use or is being made and ill-effects, equally new, have come from handling it. Generally, however, it is mostly a question of the commonsense application of a few rules, carefully based on existing knowledge of the hazardous material and the manner in which it has been able to bring its ill-effects into prominence. Greater care in the simple and conventional methods of handling material, or of avoiding contact in whatever phase it may be, will greatly reduce the risks. Special rules, with their own precautionary features, carry safety to a stage considerably greater if not absolute, and then—with the right personnel—there is little more that can be done.

* * * *

While new safety rules can easily come into being, if we are conscientious enough to make them as the need arises, it seems that we are often a little neglectful of periodically reviewing such rules as have been made in the past and which have steadily accumulated. An excess of safety rules is as bad as none whatever; likewise, the retention of rules that are no longer useful. Once every year it is good to look back upon the additions to the works' book of rules and orders, taking each item in turn and weighing up the need of retaining it or removing it. Some, in the form of official regulations, have to be recognised so long as we are bound to recognise them by law. Others, of our own making, we might strike off of our own free will when circumstances so indicated, were it not for the fact that fellow-men in the works might have their own opinions to voice. In this matter, as works executives, we are bound to consult those who are more personally concerned or who might suffer in consequence of any change made. There may always be one individual worker who is aggrieved. Removal of a rule, if indicated, must come by common consent when it has been discussed by the works safety committee.

* * * *

For the employer there is monetary profit in a sound outlook on the health of the employees. Bad health, like accidents, brings loss of time, and sometimes there are minor alterations in routine as a consequence of the temporary loss of an employee who fits perfectly into his appointed place in the works. Where personnel approaches the ideal, there is really no dividing line between the skilled and the unskilled—both have their own sphere of work, and the unskilled worker may be just as skilled in what he does, as is the man who in our ignorance we designate as a key man. For each member of the works staff, irrespective of the nature of his work, we must set out to obtain and maintain a good degree of health, and where there are special hazards to turn the course of events we must make even greater effort to achieve all that is desirable. The employer who finds satisfaction in his show of profits gained at the expense of the health of some of his employees has something definitely wrong in his make-up. To say the least, he is a bad citizen and fellow-man.

* * * *

Employees at chemical works fall into two categories—those who are expected to know the dangers that exist, and those whose work is of such a nature that they are not expected to know more than they are told. The workman who has had some sort of technical training knows that there can be danger in an invisible vapour which has escaped unintentionally; he knows, too, that the washing of hands and face has to be regarded as a safeguard rather than a pleasure when chemicals have been handled. A bad headache at the end of the day's work tells him that something is wrong, and he is usually able to interpret the cause and to describe his symptoms. The so-called unskilled labourer who is shovelling away a waste solid, or is working over a culvert where an effluent is running to waste, or is engaged in some task in an ill-ventilated building adjacent to some particular plant, may have a popular fear of the danger of chemicals—of acids and "spirits" that burn, and of poisonous gases—but may be wholly ignorant of the true cause of a headache, which comes occasionally and then somewhat regularly at intervals. It is for his benefit that he should be taught that chemicals are not generally so dangerous as popular opinion regards them, and that much greater danger is often lurking at the back of an unusual symptom he has noticed in his general health and which he did not consider sufficiently bad to report. Educated to the risk of hazards, considered in their correct light, he will develop a conscientious outlook upon signs of danger. His nose and eyes will eventually become as skilled as hands in those tasks which we called unskilled.

THE IODINE EDUCATIONAL BUREAU, Stone House, Bishopsgate, E.C.2, deserves commendation for its publication of "Iodine Facts," which is most interesting and topical. New knowledge and novel uses of iodine are constantly being reported, so that future issues should be equally welcome. Altogether, 47 iodine "facts" are given in this first issue, the articles including "Properties of an Ideal Antiseptic," "Iodates and Iodides in Wound Dressings" and "Formulæ of Iodine Solutions." A useful and well arranged index is included.

Explosive Risks in "Empty" Vessels

Treatment with Inert Gas

by H. SEYMOUR

DURING recent years a number of explosions have occurred, chiefly in the chemical industries, involving tanks, process vessels or other containers, which have held explosive or inflammable gases or fluids, but which have been emptied. As a result of these accidents several works have adopted the practice of purging these so-called "empty" vessels with an inert gas before any operations are undertaken on them.

To form an explosive mixture, of course, with any combustible gas or vapour the correct proportion of air must be present. If small increments of combustible gas are successively mixed with air, a composition will be reached at which the mixture just becomes explosive. The concentration of combustible gas at this composition, known as "the lower explosive limit," represents the minimum concentration of the particular combustible gas or vapour in mixture with air that will propagate flame if ignited. If the concentration of combustible gas in this mixture is progressively increased, a composition will be reached at which the mixture again becomes non-explosive, and the concentration just before this point is reached is known as "the upper explosive limit," representing the maximum concentration of the gas-air mixture that will propagate flame if ignited. All compositions between the upper and lower limits are within "the explosive range."

Properties of Inert Gases

From experiments made to determine the explosive limits of various inflammable gases and vapours used in industry—it is now well established that inert gases, such as carbon dioxide and nitrogen, have the property not only of depressing or narrowing the explosive range of any combustible gas or vapour, but also of preventing the formation of explosive mixtures when these inert gases are mixed in suitable proportions either with the air, or with the combustible gas, or with an explosive mixture of both. Consequently the use of an inert gas for clearing a vessel is urged before any work is undertaken on the vessel or the piping in its immediate vicinity. Two typical instances are met with in industry, firstly, when plant containing air is to be placed in combustible gas or vapour service, and secondly, when equipment containing combustible gas or vapour is to be withdrawn from service. The object of purging with inert gas is to avoid the presence of an explosive mixture at all times during the period when the air or combustible gas is being displaced from the equipment before either of these operations.

When purging from air to inert gas the object is to reduce the oxygen content of the air in the equipment to such a point that this particular combustible gas may be subsequently introduced without forming an explosive mixture. Experiments conducted by the Consolidated Gas Co. of New York, using nitrogen as the inert gas, showed that the safe condition will be reached when the oxygen content of the atmosphere in the container has been reduced by the introduction of nitrogen to below approximately 8.6 per cent. by volume. Similarly, when withdrawing equipment containing this particular mixed gas from service or when purging from combustible to inert gas, the object is to reduce the combustible gas content of the atmosphere in the equipment to such a point that the air may be subsequently introduced without forming an explosive mixture. In this case it was found that a safe condition is reached when the combustible gas content of the atmosphere in the equipment has been reduced to below about 11 per cent. by volume. Data from the tests showed that carbon dioxide is more effective than nitrogen as an inert gas, since a smaller volume is required to render the given combustible gas non-explosive. The effect of combustion products, a common practical source of inert gas, is intermediate between carbon dioxide and nitrogen depending on its composition.

From trials with various types of inert gas, it is concluded that exhaust gas from motor cars and petrol-driven air compressors are, taken all round, the most satisfactory "purges," since they can usually be made in any establishment. Standard petrol-driven air compressors are better suited for purging operations than car engines, since they may be run under load, thus consuming more fuel and producing a larger volume of inert gas in a given time. The yield of inert gas from an air compressor engine may be estimated at 1000 cu. ft. per gal. of petrol consumed, though with properly adjusted equipment in good operating condition, yields in excess of 1200 cu. ft. may be readily obtained.

Carburation Tests

Tests were made to determine the likelihood of producing an inert gas of dangerous composition with extreme adjustments of carburetter to the rich and the lean sides, and with one engine cylinder rendered inoperative, in which case the air-petrol mixture to the cylinder passed into the exhaust gas unburned. With the carburetter adjusted to the leanest mixture at which engine running could be maintained against a load of 40 lb. air pressure, the exhaust gas produced contained approximately 10 per cent. carbon dioxide and 7 per cent. oxygen and would not support combustion in any mixture with an inflammable gas of 540 B.Th.U. per cu. ft. when subjected to the action of a spark in an explosion vessel. With the carburetter adjusted to the extreme rich mixture at which engine running could be maintained against the 40 lb. load, the exhaust gas produced contained as much as 11.7 per cent. oxygen and was explosive when mixed with air in proper portions. It was not until the carbon dioxide content of the exhaust gas had been increased to about 10.5 per cent. that it was no longer explosive in mixture with air, showing that a dangerous composition of exhaust gas is produced over a range on the rich side of carburetter adjustment.

Use of Flue Gas

Boiler flue gas may also be used for purging, though the combustion process must be carefully controlled to produce inert gas of the required composition. Because of the difficulty in effecting such control, the flue gas from hand-fired solid fuel boilers should not be used for purging purposes. In general, it is found that the volume of inert gas to be available within the allotted time of the purging operation should be equal to at least twice the volume of the apparatus to be purged, and the supply must be reliable.

The American Gas Association has issued recommendations on purging practice which, though intended primarily for gasworks use, apply also to other works where explosive gases or vapours are handled. In these recommendations it is pointed out that the necessary piping, valved vents, test cocks and pressure gauges should be installed. The vents should be of adequate size to discharge the purge gas without building up a pressure greater than the normal gas pressure imposed on the equipment in service. Precautions should be taken against all sources of ignition in the immediate vicinity of the equipment. Workmen should be cautioned that the inert gas and purge gas are suffocating or poisonous, and should not be inhaled. A competent gas analyst should be present throughout the purging to determine the quality of the inert gas and test the purge gas. Isolation of the equipment to be purged from sources of inflammable gas during purging is a necessity. The inflammable gas lines to equipment of large volume should be disconnected and closed with a blank flange, plug or cap.

With small volume equipment, the valves on the connections should be fully closed and adequately sealed and vented.

Precautions should be taken to guard against by-passing of the inert gas from the inlet connection to any of the vents, and to ensure that the inert gas flows through all parts of the equipment. If the purging operation is interrupted for any reason, precautions should be taken to prevent marked shrinkage of the volume of inert gas in the equipment. This is particularly important in removing equipment from inflammable gas service when the temperature and water content of the inert gas are relatively high, for shrinkage in the volume of inert gas may result in air being drawn into the equipment, and closing of the vents might result in damage. Purging with inert gas should be continued until tests show that the oxygen or the inflammable gas content of the purge gas in the equipment, according to whether the equipment is being placed in or withdrawn from service, has been reduced to the point of safety. When the safe end-point has been reached, the purge gas may be displaced with either air or inflammable gas as the case may require.

When equipment is withdrawn from service, the atmosphere in the equipment should be tested frequently to determine that a safe condition is maintained, that is, that dangerous concentrations of combustible gas or vapour do not accumulate in the contained atmosphere. The tests should indicate the explosibility of the atmosphere; and if men are to enter the equipment, the atmosphere should be free from respiration risks, and adequate ventilation maintained.

The Sulphite Cellulose Process

Recent Swedish Research

RECENT investigations carried out at the Stockholm Cellulose Institute by Holger Erdtman (*Svensk Papperstidning*, July 31, 1940, pp. 255-263) throw light upon the way in which the presence of phenols during the cooking process may influence the lignin content. Conifer wood lignin appears to contain at least two atomic groupings differing in their reactivity towards sulphite and phenols. While one of these groups reacts with sulphite in acid, neutral or alkaline media during the cooking operation and readily reacts with phenols under strongly acid conditions (but not otherwise), the second group is affected by sulphite only in a strongly acid liquor and has little or no reactivity with phenols throughout the entire *p*H range.

The more strongly the wood is subjected to preliminary sulphite pulping in the absence of phenols, the less does the presence of phenols interfere with further pulping with sulphite. Digestion of pinewood with weakly acid liquor in pressenc eof phenols leads to sulphitation, but not to phenolation of the first of the above-mentioned groups. On subsequent digestion of the wood with normal liquor the second group reacts with sulphite to form the easily soluble lignin sulphonic acid. The well-known two-stage process for pinewood pulp is based on this difference in reactivity of the sulphitable groups of lignin towards sulphite and phenols.

Products with a very high lignin content are obtained wher wood is cooked with an acid reagent in the normal way in presence of phenols exerting a strong retarding action. In this treatment the lignin, or rather the phenolignin, only undergoes slight sulphitation and only separates very slowly from the solid phase. Relatively small amounts of very reactive phenols exert a marked retarding action on the pulping of wood. When Swedish pinewood is cooked in the normal way in presence of resorcinol, one molecule of the latter reacts with about six lignin units (with average mol. weight of 178), the wood residue then containing some three-quarters of the total lignin. Temperature changes may profoundly modify these results, as shown by the fact that *slow* heating of pinewood or fir heartwood with acid in presence of resorcinol results predominantly in sulphitation and gives products poorer in lignin than would be obtained by digestion with *rapid* rise in temperature.

Carbon Black in Cement Making

New Application as a Grinding Aid

COLLOIDAL carbon, commonly known as carbon black, is an effective grinding aid in the manufacture of Portland cement, according to the results of research carried out by the Columbian Carbon Co.'s Industrial Fellowship at the Mellon Institute, Pittsburgh. The report of this investigation discloses that a carbon dosage as low as 0.32 per cent. on the clinker increases the fineness of the cement by 30 per cent. when the time of grinding is constant, and that the same carbon dosage decreases the grinding time by 28 per cent. when the grinding is run to constant fineness. With a 1 per cent. dosage these improvements become 50 per cent. and 34 per cent., respectively. In terms of power saving and increased output such results are of real significance.

The cements prepared with carbon present as a grinding aid compared to the controls showed improved strength properties in tensile and compression tests on mortars. These benefits are attributed in the main to the increased fineness of the cement, although there is evidence that the carbon *per se* is contributory. The use of carbon in dosages up to 1 per cent. does not appreciably alter the consistency, setting time, or soundness of the cement, and has no noticeable effect on the resistance of cement mortars to freezing and thawing treatment. A new application for colloidal carbon, which has already reached important dimensions, is thus indicated for the cement and related industries.

The colloidal carbon used throughout this study was the grade termed "Cem Beads," a pellet form of a standard channel carbon manufactured from natural gas, with physical and chemical properties essentially similar to the carbon black used in the rubber industry. The diameter of the ultimate carbon particles in the pellet averages about 30 $m\mu$, thus establishing the colloidal nature of the pigment.

Organic Halogen Compounds

Detection of Toxic Gases in Industry

WITH the issue of No. 12—Organic Halogen Compounds (H.M. Stationery Office; 2d.)—the Department of Scientific and Industrial Research completes its series of leaflets on methods for the detection of toxic gases in industry.

The wide use of organic halogen compounds as solvents and cleaning agents makes the occurrence of dangerous concentrations of the vapours possible in such industries as the artificial silk, bleaching and dyeing, dry cleaning, electroplating, engineering, lithography, rubber, etc. Ten of the commonest organic halogen compounds are dealt with, and the symptoms due to exposure to the vapours described. The effects are mainly narcotic, but tetrachloroethane, for example, is highly injurious to the liver.

The method of detection described is by the use of a form of blow lamp called the "Halide Detector Lamp" which burns pure alcohol in a supply of the air under test. The organic halide is decomposed, the corresponding copper halide is formed on a small copper screw in the nozzle of the lamp and, depending on the nature of the organic halide, the degree of green coloration in the flame indicates the concentration present. A table is given linking the appearance of the flame with concentrations of each of the ten halides. The exact procedure to be followed in using the lamp is described in the latter part of the leaflet. It must not be taken into an atmosphere containing inflammable vapours, and a special method of test is outlined for use when inflammable vapours are present.

"Twenty Years After," published by the LONDON CO-OPERATIVE SOCIETY, LTD., is a commentary on the growth of the Society. The articles include one entitled "The L.C.S. Laboratory," of which there is also a photograph.

Personal Notes

MR. WALTER LEONARD ELLIOT, research chemist at the Runcorn works of Imperial Chemical Industries, Ltd., was married last week at Morecambe to Miss Marjorie Johnston.

A presentation from workmen and officials has been made to MR. JOHN MCCONWAY, general manager of the Bede Metal and Chemical Co., Ltd., Hebburn-on-Tyne, who has completed 50 years' service with the firm.

MR. P. A. DELAFIELD, of F. A. Hughes and Co., Ltd., has been released from military duties to take up the appointment of Assistant to the Controller of Plastics. MR. F. E. MIDDLEDITCH (Thos. De La Rue and Co., Ltd.) and MR. W. T. PATTMAN (Bakelite, Ltd.), have also joined the Control as Technical Officers

MR. J. B. DUNN (Champion, Druce and Co., Ltd.) has been elected chairman of the British Colour Makers' Association for the ensuing twelve months; MR. J. CROMBIE (James Anderson and Co. (Colours), Ltd.), vice-chairman; and MR. C. G. A. COWAN (Cowan Bros. (Stratford), Ltd.), honorary treasurer. The secretary is MR. ALLAN J. HOLDEN.

OBITUARY

DR. GWILYM OWEN, late Professor of Physics and Vice-Principal of the University College of Wales, Aberystwyth, died at Liverpool on November 9, aged 60. He was educated at Liverpool University and later, at Cambridge, was a research student under Sir J. J. Thomson at the Cavendish Laboratory.

MR. WILLIAM JARVIE, who died recently at Thorntonhall, Lanarkshire, aged 55, was a director of William Baird and Co., Ltd., of Bairds and Scottish Steel, Ltd., and of the National Benzole Company, Ltd. Since 1936 he had been in charge of Bairds' coke oven plant. He also held an executive post in the British Sulphate of Ammonia Federation, Ltd.

MR. JOSEPH ROBERT JOHNSON, F.I.C., who died last week at Selly Oak, aged 57, was chemist to Messrs. Cadbury Bros., Bournville, Birmingham. Mr. Johnson was chairman of the Birmingham and Midland Section of the Institute of Chemistry and chairman of the Midland Chemists' Committee. Representatives of chemical organisations in the Midlands, and of the Cadbury interests, attended the memorial service at Lodge Hill Cemetery.

MR. ARTHUR GEORGE BLOXAM, F.I.C., who died this month, aged 74, as a result of enemy action, was well known to a wide circle of chemists, industrial and otherwise. He was a Fellow and Past President of the Chartered Institute of Patent Agents, and, as a partner in the distinguished firm of Abel and Imray, he had had the handling of many famous chemical patents, notably continental. He was the author, with B. Blount, of "Chemistry for Engineers and Manufacturers," and with S. J. Lewis, of "Chemistry, Inorganic and Organic." He was brought up in the scientific tradition: his father was Charles London Bloxam, Professor of Chemistry at King's College, and his uncle was Sir Frederick Abel, F.R.S., who was specially noted for the invention of cordite and for his association with the chemical department at Woolwich. Educated at King's College School and King's College, London, Arthur Bloxam assisted Miller Thomson there in his chemical and photographic work in 1884-87, and then became chief assistant to Kinch and demonstrator at the Royal Agricultural College, Cirencester. He was employed in the chemistry department of the Goldsmiths' Institute, New Cross, in 1893-97. In the Institute of Chemistry he was elected Associate in 1888 and Fellow in 1891, and served on the Council in 1914-15.

New Control Orders

Exemptions from K.I.D.

THE Treasury has made the Safeguarding of Industries (Exemption) No. 14 Order, 1940, exempting ethyl cellulose, ethyl cyanacetate, and ethyl orthoformate from Key Industry Duty from November 8 until December 31, 1940.

Iron and Steel Imports

The Treasury has issued the Import Duties (Exemptions) (No. 9) Order, 1940, which exempts from duty tubes and pipes of iron or steel, other than cast tubes and pipes and steel bulbs of the kind used in aerated water syphons, and the Additional Import Duties (No. 10) Order, 1940, which removes the additional duties on certain forgings of iron or steel. The Orders are effective from November 14.

Caustic Potash

The Minister of Supply has decided, in view of an improvement in the immediate stock position of caustic potash, to allow approved consumers to purchase stocks of commercial grades of solid caustic potash, on the basis of 3 months' normal requirements at current rates of consumption, to hold in reserve and for consumption only as subsequently permitted by the Minister. A special licence will be issue for the purpose during November only, and will be valid for lodgment with supplying merchants up to December 31. Reserve stocks acquired under these special licences will not be taken into account when application for normal licences to consume are granted, and such stocks will be shown separately on application forms. The normal application form is not applicable to the above arrangements and special application forms may be obtained from the Secretary, Raw Materials Department, Ministry of Supply, The Castle, Warwick.

Export Control Consolidation

The Board of Trade has made the Export of Goods Control (No. 39) Order (1940), which came into force on November 15, by which the list of goods subject to the existing Export of Goods Control Order are consolidated, and the lists of destinations to which all or certain goods may only be exported under licence are revised as follows:—

On and after November 15 no goods may be exported without licence to: Bulgaria, Estonia, Finland, French Colonies and Mandated Territories (other than French Cameroons, French Equatorial Africa, French Settlements in Oceania, New Caledonia, New Hebrides, and French Settlements in India), Greece, Hungary, Latvia, Liechtenstein, Lithuania, Poland, Rumania, Sweden, Switzerland, Vatican City, and Yugoslavia, or to any port or destination in the U.S.S.R. on the Black Sea, Baltic Sea, or Arctic Sea, or to enemy territories.

The position with regard to the goods included in Lists A and B is not changed by this Order. On and after November 15 the goods included in List C may not be exported without licence to: Andorra, Faroe Islands, Formosa, Iceland, Iran, Iraq, Japan, Japanese Mandated Islands, Korea, Kwangtung Leased Territory, Manchuria, Portugal (including Madeira, the Azores, and the Cape Verde Islands), Rio de Oro, Spain (including the Canary Islands and the Spanish Zone of Morocco), Tangier Zone, Turkey, including the Hatay, or to any port or destination in the U.S.S.R. not on the Black Sea, Baltic Sea, or Arctic Sea.

The Hilger Photometric Comparator, a simple instrument for approximate spectro-photometric analysis and for investigating colour differences, is described in a leaflet published by ADAM HILGER, LTD., 98 St. Pancras Way, London, N.W.1. There is also a description of the Hilger Photometric Amplifier, which is used in conjunction with the Comparator. These instruments are applicable to dyed and dyeing materials, cellulose products, plastics and similar moulded materials, etc.

General News——
——From Week to Week

THE AGE OF RESERVATION of ship painters, redleaders and a number of occupations in soap manufacture, under the Schedule of Reserved Occupations, has been raised from 30 to 35.

IT HAS BEEN DECIDED by the Customs Authorities that purchase tax is not chargeable on insecticides and fly sprays for animals (not being medicines for internal use or for the treatment of external sores).

AMONG THE 196 NEW ADDITIONS to the "Black List" of traders in neutral countries with whom it is unlawful to have dealings of any kind, the following may be of interest to the chemical industry: Tintas Victoria, Ltda., Rio de Janeiro and S. Paulo; Usina Siderurgica e Laminadora N.S. Aparicida S.A. "Sidapar," S. Paulo, Brazil; Dah Sing Chemical Supply Co., Shanghai; Fibra Comercial Lusitana, Ltda., and Textil Artificial do Porto, Ltda., both of Oporto; Fibra Comercial de España, S.A., Barcelona; and S.A. Fertilizzanti Nazionali Italiani (S.A.F.N.I.), Madrid. (Trading with the Enemy, Specified Persons, Amendment, No. 12 Order).

THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH has just issued the Report of the Fuel Research Board for the year ended March 31, 1939 (H.M.S.O., 3s. 6d.). Problems under investigation include the deterioration of coal by weathering, the cleaning of fine coal, and the "dustproofing" of coal. Research work in progress covers the hydrogenation of different raw materials, a study of catalysts, and the "cracking" of oils. Laboratory experiments and work on a plant of semi-technical scale are both described, and further treatment of certain fractions of the primary product shows promise of yielding lubricating oil; and an account is given of the development of gas producers for motor vehicles.

Foreign News

A NEW ALUMINIUM PLANT with a yearly capacity of 10,000 metric tons is about to be erected at Tósokberény, Hungary, by Hungarian Bauxite Mines, Ltd., according to the "News Edition" of the American Chemical Society.

THE UNITED STATES TREASURY has ruled that the British purchase tax must be included in the value of goods imported from the United Kingdom for the purpose of establishing ad valorem duties.

THE UNITED STATES WAR DEPARTMENT is arranging for the construction of a plant to produce TNT and DNT, at Wilmington, Illinois. The plant, which should be completed within nine months, is to be operated by E. I. du Pont de Nemours and Company.

ASCORBIC ACID (vitamin C) is added to the list of chemicals made in Canada, for the purpose of administrating the appropriate customs tariff. The ruling of the Dominion Department of National Revenue to this effect became operative on October 16.

MORE THAN TWENTY PERSONS have, it is feared, been killed in three explosions in industrial centres of New Jersey and Pennsylvania. These included an explosion at a powder factory at Edinburg (Pennsylvania), owned by the American Cyanamid Corporation, and another at the Trojan Powder Company's factory on the outskirts of Allentown (Pennsylvania).

Forthcoming Events

A PAPER ON "Some Problems of War-time Labour Management" will be read before the Royal Society of Arts, at John Adam Street, London, W.C.2, by Mr. K. G. Fenelon, M.A., Ph.D., Lecturer in Industrial Administration, University of Manchester, on November 13. The chair will be taken at 1.45 p.m. by Mr. Robert R. Hyde, M.V.O., Director of the Industrial Welfare Society.

THE 208TH MEETING of the Society of Glass Technology will be held in the Lecture Theatre of the Department of Glass Technology of the University of Sheffield, at "Elmfield," Northumberland Road, Sheffield 10, on November 20, at 2 p.m. The two following papers will be presented and discussed: (a) The Softening Point of Glass, by Dr. J. T. Littleton, of Corning Glass Works, U.S.A. (presented by Professor W. E. S. Turner); (b) Standard Discs in the Strain Testing of Glassware, by Dr. E. J. Gooding, of Rockware Glass Syndicate, Ltd., Greenford.

SPECIAL AFTERNOON LECTURES before Christmas of the Royal Institution, 21 Albemarle Street, London, W.1, include a paper by Professor J. D. Bernal, who will speak on "The Physics of Air Raids," on December 3, and one by Professor H. D. Kay, dealing with "Some Recent Advances in Dairy Science." Both lectures will start at 2.30 p.m. Single lecture ticket, 2s. 6d.

A JOINT MEETING of the Chemical Engineering Group (Society of Chemical Industry) and the Institution of Chemical Engineers will be held on December 10, at 2.30 p.m. in the rooms of the Chemical Society, Burlington House, Piccadilly, London, W.1, when a discussion on "The Salvage of Waste Materials in the Chemical Industry" will be opened by Dr. A. B. Manning, Assistant Controller of Salvage in the Ministry of Supply. The chair will be taken by the chairman of the Chemical Engineering Group, Mr. H. W. Cremer.

A Chemist's Bookshelf

METHANE, ITS PRODUCTION AND UTILISATION. By J. P. Lawrie. London: Chapman and Hall. Pp. 66. 6s.

Though we have little natural petroleum in Great Britain, we have large unused reserves of methane gas which can be utilised as an alternative, and, as Lord Strabolgi writes in his foreword to the volume here reviewed, "the present war may conceivably be won on oil." In addition to being found in oil and coal deposits, methane may be synthesised or produced from coal gas, coke-oven gas and water gas. The hydrogenation and complete gasification of coal represents, according to Mr. Lawrie, an unlimited supply of methane.

Among many interesting data in this most serviceable volume, Mr. Lawrie produces figures in connection with the use of compressed coal gas for motor transport, namely that to produce quantities sufficient to supply all the vehicles in the country, it would be necessary to carbonise not less than 15,000,000 tons of coal annually. But the maximum carbonisation capacity of the gasworks to-day, to meet the ordinary demands of the country, is only 20,000,000 tons, and it would be impossible to extend the output by the requisite amount. Here the value of methane makes itself felt. It is superior to coal gas as a fuel for motor transport, since it has double the calorific value, and the amount of coal needed would, therefore, be decreased by some extent.

Ordinary coal gas contains methane in proportions up to 40 per cent., but its utilisation for methane production raises the problem of disposal of the poor quality gas that remains. It is estimated that coke-oven gas offers a potential source of methane to the extent of 2,800,000,000 cu. ft. a year, representing 14,000,000 gallons of petrol. Water gas is readily converted into methane by passage over nickel at about 300° C., and this property has been utilised on a large scale for the production of gas of high calorific value. Unfortunately, all these processes suffer the same disadvantage: they entail the use of an existing fuel. As Mr. Lawrie points out, no accurate figures of supply can be given, but the fact remains that supplies are at present substantial, and development can render them vast.

Although the number of pages has been reduced, the customary standard of interest is maintained in the October issue of the "Allen Engineering Review," published by W. H. ALLEN, SONS AND CO., LTD., Bedford. Nine articles are included.

Prepared before the war but only now available for distribution, owing to various delays, a comprehensive catalogue published by CROFTS (ENGINEERS), LTD., Thornbury, Bradford, describes all their latest designs of efficiency geared motors and reduction gears and is so arranged as to enable prospective customers to select without difficulty a suitable unit for any required speed and horse power.

Weekly Prices of British Chemical Products

THE steady conditions reported last week continue to be maintained, with a movement in heavy chemicals of fairly substantial dimensions. Most of the potash and soda products are in good call and ex contract deliveries cover good volumes. Acetone, formaldehyde and acetic acid are moderately active. The price position on the whole remains steady, chlorate of soda is dearer by £2 per ton as from November 1, but elsewhere there is no alteration of any importance. The market in coal tar products is perhaps a little brighter than during recent weeks, rather more inquiry being in circulation both for home and export. A steady business is reported both for naphthalene and xylol.

MANCHESTER.—In some quarters a rather better demand has been reported on the Manchester market during the past week for the various descriptions of textile chemicals, whilst fair deliveries are being taken by most of the other chief industrial consumers. New business on home and shipping accounts has been on moderate lines. Values generally remain on a steady to firm basis. Among the by-products the light distillates, including xylol, which is fetching higher rates, are firm and active sections, whilst a fair trade is reported in crude tar and crude carbolic. Pyridine is in moderate request and not too strong.

GLASGOW.—The position in the Scottish heavy trade remains unchanged both for home and export business. For the most part, however, prices remain firm, but supplies are scarce and prompt delivery is the most serious obstacle the trade has to contend with. If buyers would remember this and order in good time, disappointment and inconvenience would be overcome.

Price Changes

Rises: Ammonium Phosphate Fertilisers, Concentrated Complete Fertilisers, Sodium Chlorate.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton £36 10s.; 10 cwt./1 ton, £37 10s.; 4/10 cwt., £38 10s.; 80% pure, 1 ton, £38 10s.; 10 cwt./1 ton, £39 10s.; 4/10 cwt., £40 10s.; commercial glacial, 1 ton, £46; 10 cwt./1 ton, £47; 4/10 cwt., £48; delivered buyers' premises in returnable barrels. £4 per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 50 tons and over, £52 10s.; 10/50 tons, £53; 5/10 tons, £53 10s.; 1/5 tons, £54; single drums, £55, delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each; delivered in containers of less than 45 gallons but not less than 10 gallons £10 10s. per ton in excess of maximum prices; delivered in containers less than 10 gallons each £10 10s. per ton in excess of maximum prices, plus a reasonable allowance.

Alum.—Loose lump, £9 10s. per ton, d/d, nominal.

Aluminium Sulphate.—£8 to £8 10s. per ton d/d.

Ammonia Anhydrous.—99.95%, 1s. 7d. to 2s. per lb., according to quantity and type of cylinders which are returnable; carriage paid; less for important contracts.

Ammonium Carbonate.—£32 to £36 per ton d/d in 5 cwt. casks.

Ammonium Chloride.—Grey galvanising, £18 per ton, in casks, ex wharf. MANCHESTER: Grey galvanising, £19 to £20 per ton. See also Salammoniac.

Antimony Oxide.—£68 per ton.

Arsenic.—99/100%, about £30 per ton, ex store.

Barium Chloride—98/100%, prime white crystals, £11 10s. 0d. to £13 per ton, bag packing, ex works; imported material would be dearer.

Bleaching Powder.—Spot, 35/37%, £9 10s. to £10 per ton in casks, special terms for contract.

Borax, Commercial.—Granulated, £23; crystals, £24; powdered, £24 10s.; extra fine powder, £25 10s.; B.P. crystals, £32; powdered, £32 10s.; extra fine, £33 10s. per ton for ton lots, in free 1 cwt. bags, carriage paid in Great Britain. Borax Glass, lump, £68; powder, £69 per ton in tin-lined cases for home trade only, packages free, carriage paid in Great Britain.

Boric Acid.—Commercial, granulated, £37 10s.; crystals, £38 10s.; powdered, £39 10s.; extra fine, £41 10s.; large flakes, £50; B.P. crystals, £46 10s.; powdered, £47 10s.; extra fine powdered, £49 10s. per ton for ton lots in free 1-cwt. bags, carriage paid in Great Britain.

Calcium Bisulphite.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/75% solid, £5 10s. per ton ex store.

Charcoal Lump.—£10 10s. to £14 per ton, ex wharf. Granulated, supplies scarce.

Chlorine, Liquid.—£19 15s. per ton, d/d in 16/17 cwt. drums (3-drum lots); 4¾d. per lb. d/d station in single 70-lb. cylinders.

Chrometan.—Crystals, 4½d. per lb.; liquor, £19 10s. per ton d/d station in drums. GLASGOW: Crystals 4d. per lb. in original barrels.

Chromic Acid.—1s. 2d. per lb., less 2½%; d/d U.K. GLASGOW: 1s. 0½d. per lb. for 1 cwt. lots.

Citric Acid.—1s. 2d. per lb. MANCHESTER: 1s. 6d.

Copper Sulphate.—About £29 10s. per ton f.o.b. MANCHESTER: £28 10s., less 2 %, in 5 cwt. casks f.o.b. Liverpool.

Cream of Tartar.—100%, £10 2s. per cwt., less 2½%, d/d in sellers' returnable casks.

Formaldehyde.—£21 15s. to £25 per ton d/d. MANCHESTER: 40%, £24 to £25 per ton in casks d/d; imported material dearer.

Formic Acid.—85%, £44 10s. per ton for ton lots, carriage paid, carboys returnable; smaller parcels quoted at 46s. 6d. to 49s. 6d. per cwt., ex store.

Glycerine.—Chemically pure, double distilled, 1,260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, 1s. 4d. per lb.; free-running crystals are quoted at 1s. 7½d. to 1s. 10½d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 6s. 1½d. to 8s. 7½d. carboy d/d according to purity, strength and locality.

Iodine.—Resublimed B.P., 9s. 2d. to 13s. per lb., according to quantity.

Lactic Acid.—Dark tech., 50% by vol., £31 per ton; 50% by weight, £38; 80% by weight, £67; pale tech., 50% by vol., £39 10s.; 50% by weight, £46, 80% by weight, £74. Not less than one ton lots ex works; barrels returnable, carriage paid.

Lead Acetate.—White, £46 10s. to £48 10s. ton lots. MANCHESTER: £48 to £50 per ton.

Lead Nitrate.—About £45 per ton d/d in casks.

Lead, Red.—English, 5/10 cwt. £42; 10 cwt. to 1 ton, £41 15s.; 1/2 tons, £41 10s.; 2/5 tons, £41; 5/20 tons, £40 10s.; 20/100 tons, £40; over 100 tons, £39 10s. per ton, less 2½ per cent. carriage paid; non-setting red lead 10s. per ton dearer in each case. Continental material £1 per ton cheaper.

Lead, White.—Dry English, less than 5 tons, £52 10s.; 5/15 tons, £48 10s.; 15/25 tons, £48; 25/50 tons, £47 10s.; 50/200 tons, £47 per ton less 5 per cent. carriage paid; Continental material £1 per ton cheaper. Ground in oil, English, 1/5 cwt., £61; 5/10 cwt., £60; 10 cwt. to 1 ton, £59 10s.; 1/2 tons, £58; 2/5 tons, £57; 5/10 tons, £55; 10/15 tons, £54; 15/25 tons, £53 10s.; 25/50 tons, £53; 50/100 tons, £52 10s. per ton less 5 per cent. carriage paid. Continental material £2 per ton cheaper.

Litharge.—1 to 2 tons, £41 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £14 to £17 per ton

Magnesium Chloride.—Solid (ex wharf), £12 to £13 per ton. MANCHESTER: £13 to £14 per ton.

Magnesium Sulphate.—Commercial, £10 to £12 per ton, according to quality, ex works.

Mercury Products.—Controlled price for 1 cwt. quantities: Bichloride powder, 12s. 3d.; bichloride lump, 12s. 10d.; ammon. chloride powder, 14s. 2d.; ammon. chloride lump, 14s.; mercurous chloride, 14s. 7d.; mercury oxide, red cryst., B.P., 16s. 4d.; red levig. B.P., 15s. 10d.; yellow levig. B.P. 15s. 9d.

Methylated Spirit.—Industrial 66 O.P. 100 gals., 2s. 0½d. per gal.; pyridinised 64 O.P. 100 gals., 2s. 1½d. per gal.

Nitric Acid.—£21 10s. to £29 10s. per ton ex works.

Oxalic Acid.—From £59 5s. per ton for ton lots, carriage paid, in 5-cwt. casks; smaller parcels would be dearer; deliveries slow.

Paraffin Wax.—Nominal.

Potash, Caustic.—Solid, 88/92%, commercial grade, £53 7s. 6d. per ton, c.i.f. U.K. port, duty paid.

Potassium Dichromate.—Crystals and granular 5d. per lb.; ground 7d. per lb., carriage paid. MANCHESTER and GLASGOW: 6d. per lb. in orig. casks.

Potassium Carbonate.—Hydrated, 83/85%, £46 17s. 6d. per ton; calcined, 98/100%, £52 2s. 6d. per ton, c.i.f. U.K. port.

Potassium Chlorate.—Imported powder and crystals, ex store London, 10d. to 1s. per lb.

Potassium Iodide.—B.P., 8s. to 11s. 2d. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, £26 to £30 per ton ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 4½d. to 1s. 5½d. per lb.; commercial, £7 9s. 6d. to £8 1s. 6d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, about 1s. 2d. to 1s. 5d. per lb., supplies scarce.

Salammoniac.—Dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £16 10s. per ton, in casks, ex store.

Soda, Caustic.—Solid, 76/77% spot, £14 10s. per ton d/d station.

Soda Crystals.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

Sodium Acetate.—£37 to £40 per ton, ex wharf.

Sodium Bicarbonate.—About £10 10s. to £11 10s. per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 5d. per lb., anhydrous, 6d. per lb. net d/d U.K. MANCHESTER and GLASGOW: 5d. per lb., in orig. casks.

Sodium Bisulphite Powder.—60/62%, £16 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£36 to £45 per ton, d/d, according to quantity.

Sodium Hyposulphite.—Pea crystals, £17 15s. per ton for 2-ton lots; commercial, £13 10s. per ton. MANCHESTER: Commercial, £13 10s.; photographic, £17 10s.

Sodium Iodide.—B.P., for not less than 28 lb., 8s. 10d. per lb.; for not less than 7 lb., 10s. 9d. per lb.

Sodium Metasilicate.—£14 5s. per ton, d/d U.K. in cwt. bags.

Sodium Nitrate.—Refined, £10 to £11 per ton for 6-ton lots d/d.

Sodium Nitrite.—£20 per ton for ton lots.

Sodium Perborate.—10%, £4 12s. 6d. per cwt. d/d in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £17 per ton, delivered, for ton lots. Tri-sodium, £20 to £21 per ton d/d for ton lots.

Sodium Prussiate.—From 6¾d. per lb. ex store.

Sodium Silicate.—£9 15s. per ton, for 4-ton lots.

Sodium Sulphate (Glauber Salts).—£4 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 3s. 6d. per ton d/d station in bulk. MANCHESTER: about £4 ex works.

Sodium Sulphide.—Solid 60/62%, Spot, £14 10s. per ton d/d in drums; crystals, 30/32%, £10 5s. per ton d/d in casks. MANCHESTER: 30/32%, £10 10s. per ton in 2-ton lots.

Sodium Sulphite.—Pea crystals, spot, £16 10s. per ton d/d station in kegs; commercial, £11 15s. per ton d/d station in bags.

Sulphur.—Finely powdered, £18 10s. per ton d/d; precip. B.P., £3 9s. per cwt.

Sulphuric Acid.—168° Tw., £6 2s. 3d. to £6 13s. 3d. per ton; 140° Tw., arsenic-free, £4 7s. 6d. to £4 17s. 6d. per ton; 140° Tw. arsenious, £4 per ton; quotations naked at sellers' works.

Tartaric Acid.—2s. 6½d. per lb., less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 2s. 6d. per lb.

Zinc Oxide.—Maximum prices: White seal, £30 17s. 6d. per ton; red seal, £28 7s. 6d. d/d; green seal, £29 17s. 6d. d/d buyers' premises.

Zinc Sulphate.—Tech., about £25, carriage paid, casks free.

Rubber Chemicals

Antimony Sulphide.—Golden, 9½d. to 1s. 6d. per lb., according to quality. Crimson, 1s. 8d. to 1s. 11d. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £7 3s. 6d. per ton.

Cadmium Sulphide.—5s. 5d. to 6s. 6d. per lb.

Carbon Black.—5d. to 7⅜d. per lb., according to packing.

Carbon Bisulphide.—£32 5s. to £37 5s. per ton, according to quantity, in free returnable drums.

Carbon Tetrachloride.—£46 to £49 per ton.

Chromium Oxide.—Green, 1s. 6d. per lb.

India-rubber Substitutes.—White, 5⅞d. to 8⅞d. per lb.; dark, 5 3/16d. to 5 15/16d. per lb.

Lithopone.—30%, £25 per ton; 60%, £31 to £32 per ton. Imported material would be dearer.

Mineral Black.—£10 to £14 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£43 5s. per ton, d/d.

Vermilion.—Pale or deep, 14s. 6d. per lb., for 7 lb. lots and less.

Plus 5% War Charge.

Nitrogen Fertilisers

Ammonium Phosphate Fertilisers.—Type A, £21 8s.; B, £15 5s. 6d.; C, £18 17s. per ton in 6-ton lots, d/d farmer's nearest station up to June 30, 1941. Rebate of 1s. 6d. per ton per month for deliveries made prior to March 1, 1941.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station: November delivery £9 16s.; December, £9 17s. 6d.; January, £9 19s.; February, £10 0s. 6d.; March/June, £10 2s.

Calcium Cyanamide.—Nominal: supplies very scanty.

Concentrated Complete Fertilisers.—£15 10s. to £16 3s. 6d. per ton in 6-ton lots, d/d farmer's nearest station up to June 30, 1941. Supplies small except C.C.F. Special at £15 14s. per ton.

"Nitro-Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station up to June 30, 1941.

Sodium Nitrate.—Chilean, £13 10s. per ton in 2-ton lots, f.o.r. Liverpool, November delivery; agricultural, £10 14s. per ton in 2-cwt. bags, d/d farmer's nearest station up to June 30, 1941.

Coal Tar Products

Benzol.—Industrial (containing less than 2% of toluol), 2s. to 2s. 2d. per gal., ex works.

Carbolic Acid.—Crystals, 9½d. to 10¾d. per lb.; Crude, 60's 3s. 6d. to 4s., according to specification. MANCHESTER: Crystals, 10½d. per lb., d/d; crude, 3s. 8d. to 4s. naked at works.

Creosote.—Home trade, 5½d. to 6d. per gal., f.o.r., makers' works; exports 6d. to 6¼d. per gal., according to grade. MANCHESTER: 5d. to 7d. per gal.

Cresylic Acid.—Pale, 99/100%, 2s. 3d. per gal. MANCHESTER: Pale, 99/100%, 2s. 2d. per gal.

Naphtha.—Solvent, 90/160°, 1s. 11d. to 2s. 1d. per gal.; Heavy 90/190°, 1s. 7d. to 1s. 8d. naked at works. MANCHESTER: 90/160°, 2s. to 2s. 1d.

Naphthalene.—Crude, whizzed or hot pressed, £14 per ton; purified crystals, £27 per ton in 2-cwt. bags; flaked, £27 per ton. Fire-lighter quality, £6 to £7 per ton ex works. MANCHESTER: Refined, £26 per ton.

Pitch.—Medium, soft, 50s. per ton (nominal) f.o.b. MANCHESTER: Nominal.

Pyridine.—90/140°, 18s. 6d. per gal.; 90/160°, 16s.; 90/180°, 4s. to 5s. per gal., f.o.b. MANCHESTER: 14s. 6d. to 17s. 6d. per gal.

Toluol.—Pure, 2s. 5d., nominal. MANCHESTER: Pure, 2s. 5d. per gal., naked.

Xylol.—Commercial, 2s. 9d. per gal.; pure, 2s. 11d. MANCHESTER: 3s. to 3s. 3d. per gal.

Wood Distillation Products

Calcium Acetate.—Brown, £8 10s. to £10 per ton; grey, £13 to £14. MANCHESTER: Grey: £20.

Methyl Acetone.—40.50%, £42-£45 per ton.

Wood Creosote.—Unrefined, 2s. per gal., according to boiling range.

Wood Naphtha, Miscible.—4s. 6d. to 5s. per gal.; solvent, 5s. per gal.

Wood Tar.—£5 to £6 per ton, according to quality.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

***o*-Cresol** 30/31° C.—8d. to 9d. per lb. in ton lots.

***p*-Cresol** 34/35° C.—1s. 8d. to 1s. 9d. per lb. in ton lots.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

***p*-Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

***o*-Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

***p*-Toluidine.**—2s. 2d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—November 13.—For the period ending November 30 per ton, net, naked, ex mill, works or refinery, and subject to additional charges according to package and location of supplies:—LINSEED OIL, raw, £41 10s. RAPESEED OIL, crude, £44. COTTONSEED OIL, crude, £31 2s. 6d.; washed, £34 5s.; refined edible, £35 12s. 6d.; refined deodorised, £36 10s. SOYA BEAN OIL, crude, £33; refined deodorised, £37. COCONUT OIL, crude, £28 2s. 6d.; refined deodorised, £31 7s. 6d. PALM KERNEL OIL, crude, £27 10s.; refined deodorised, £30 15s. PALM OIL, refined deodorised, £33. GROUNDNUT OIL, crude, £35 10s.; refined deodorised, £40. WHALE OIL, crude hardened, 42 deg., £30 10s.; refined hardened, 42 deg., £33. ACID OILS.—Groundnut, £19; soya, £17; coconut and palm kernel, £22 10s. ROSIN, 20s. to 25s. per cwt., ex wharf, according to grade.—TURPENTINE, Spot, American, nominal.

HULL.—November 12.—Spot, American, nominal.

Company News

Lightalloys, Ltd., show a profit of £35,827 for the 53 weeks ended June 30, 1940 (£53,030 for the 52 weeks ended June 30, 1939). Ordinary dividend reduced from 35 per cent. to 25 per cent. with a final payment of 12½ per cent.

New Companies Registered

Soc. Chimique de Selzaete. (F.3602).—Capital, B.F.30,500,000, of which, at October 17, 1940, B.F.15,555,000 was held by Burt, Boulton and Haywood, Ltd., B.F.14,468,500 by the Imperial Continental Gas Association and B.F.476,500 by the Compagnie Générale de Gaz et d'Electricité. Registered in Belgium on February 6, 1931, to study and work on all that relates to the manufacture, trade and industry of chemical products, tar, creosote and by-products or derivatives of tar, and of oils and road construction and covering materials; the injection and impregnation of timber of all kinds, etc. British address: Brettenham House, Lancaster Place, W.C.2, where Alastair G. Saunders is authorised to accept service of process and notices on behalf of the company. Directors: Oscar E. Boulton, Kenward, Yalding, Kent; Earl of Dunmore, Alastair G. Saunders, Fdk. J. E. China, Walter C. Forbes, Wm. Harriss, Harold G. Palmer, Michael H. Tetley, Sir John Chancellor, Eric F. Dadson, Baron Rolin Jacquemin and Joseph de Brouwer.

Chemical and Allied Stocks and Shares

FOLLOWING the recent advance in British Funds and front rank investment securities, more attention has been given to the higher-yielding securities of industrial companies, and on balance there has been a fairly general marking up of values. This is not due so much to moderate improvement in demand as to the fact that many leading shares remain firmly held and are still in short supply in the market.

As was to be expected, shares of chemical and allied companies have moved in accordance with the prevailing trend. Imperial Chemical further improved from 27s. 6d. to 28s. 6d., while the 7 per cent. preference rose to 31s. B. Laporte were again 50s., but continued to be tightly held, and consequently, the price was not tested adequately by business. Greeff-Chemicals 5s. units remained around par, and Monsanto Chemicals 5½ per cent. preference at 21s. 3d., while William Blythe 3s. ordinary shares were again 5s. 3d., and British Drug Houses at 21s. 3d. were also unchanged. Among widely-held and usually active securities, Dunlop Rubber moved up strongly to 31s. 6d. British Aluminium from 39s. to 41s. 3d., and British Oxygen to 63s. 9d. Lever and Unilever developed a better tendency and rallied to 24s. 9d., while British Oil and Cake Mills preferred ordinary improved to 33s. 9d. Business up to 31s. took place in Fison Packard and Prentice ordinary shares, in advance of the dividend announcement. British Industrial Plastics 2s. units changed hands around 2s. 3d.; results of this company are also imminent. United Glass Bottle Manufacturers ordinary shares have transferred at 43s. 9d.

In response to current market dividend estimates, Turner and Newall improved further from 63s. 1½d. to 65s. General Refractories had a somewhat more active appearance around 6s. 6d. on hopes that improvement in the company's earnings has continued in the current year, while British Match were steady at 28s. 9d., and Borax Consolidated deferred units held their recent improvement to 26s. 3d. Rather more dealings were recorded in the preferred ordinary and preference units of the last-named company. Distillers ordinary units were marked up from 58s. to 60s. 3d., and United Molasses were higher at 21s. 6d. Associated Cement were very firm at 61s. 3d., and British Plaster Board improved to 12s. 6d. Pinchin Johnson at 19s. 3d. more than held last week's improvement. Nairn and Greenwich were unchanged at 43s. 9d., but Barry and Staines were higher at 28s. 9d. Further gains were recorded among leading iron and steel shares, dividends on which are generally expected to be little changed for the current year. Guest Keen were firm at 23s. on the maintained interim payment, and Stewarts and Lloyds 40s. Moreover, Tube Investments appreciated to 83s. 6d. Imperial Smelting were firm at 10s. on further consideration of the improved financial results.

Courtaulds and other rayon shares were better, sentiment having been assisted by the improved results of the North British Rayon Co. Where changed, cotton textile securities have also shown small movements in favour of holders. In other directions, Triplex Glass 10s. units were higher at 18s. 9d., and Amalgamated Metal shares were 6d. better at 18s. Boots Drug were 40s. 3d., Beechams Pills deferred shares 8s. 6d. and Timothy Whites 18s. 6d., while Sangers were 18s. British Glues maintained their recent improvement to 6s. 3d. Cerebos and Reckitt and Sons ordinary shares moved higher in accordance with the current trend on the Stock Exchange. Oil shares were better under the lead of "Shell" and Burmah Oil, and various preference shares also improved in price.

940

pre-
were
un-
nlop
rom
and
hile
9d.
tice
tish
sults
anu-

and
rac-
6d.
con-
y at
cent
d in
omed
s. to
ated
oard
held
nged
ther
divi-
for
ined
Tube
firm
sults.
ving
ayon
own
iplex
Metal
3d.,
hites
their
Sons
rrent
the
hares

S
N

D.